READABILITY OF AFTER VISIT SUMMARIES: COMPARING THE LEVEL OF INFORMATION IN AFTER VISIT SUMMARIES FROM INTERNAL MEDICINE AND FAMILY MEDICINE RESIDENCIES

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Dedication

This work is dedicated to family and friends who have influenced me to so great a degree.

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Abstract

Up to 50 percent of information provided to the patient during a consultation may be forgotten within five minutes of leaving the office. Written advice can improve compliance with medical instructions. The Centers for Medicaid and Medicare Services (CMS) thus expects physicians to provide a written summary following most patient encounters to improve quality. Additionally, major healthcare organizations have recommended that patient education material be written at a 6th-8th grade reading level. Our goal was to evaluate whether these after visit summaries (AVS) are achieving their desired end of "meaningful use" as defined by CMS. We hypothesized that the after-visit summaries provided will be written at too high a grade level and contain characteristics that are not patient friendly. Our method was to collect and review after visit summaries and grade them based on readability and usability characteristics. We analyzed 400 after visit summaries (AVS) provided to patients at Internal Medicine and Family Medicine residency clinics at Banner University Medical Center Phoenix written by residents of all levels and their attending physicians. The Flesch-Kincaid Grade Level Test (FKGL) and the Flesch Reading Ease Score (FRES) were used to evaluate readability and a scorecard composed of items determined to be a component of the ideal AVS based on criteria imposed by CMS was used in the evaluation. In both residency programs, AVS were written at a level too advanced for most patients to comprehend. The overall FKGL had a mean of 11.9 (SD 5.17) and a mean FRES of 31.8 (SD 25). The FKGL indicates the average AVS requires the reading skill of a college graduate. The FRES score classifies the difficulty of reading the average AVS as "difficult" or "very difficult" to read. AVS written by the Family Medicine residency program were found to be written at a lower grade level with a greater reading ease than those written by the Internal Medicine residency program. Despite this, both programs were more complex than current recommendations by some margin. Additionally, most AVS lacked recommended CMS criteria as follows: of all AVS, only 71.8% of AVS contained an updated medication list (287), 54% contained an updated problem list (216), 52.3% (209) contained the time and location of the next schedule or expected appointment, 35.8% had lab or diagnostic tests ordered (143), 51.5% (206) contained acronyms, 2% contained symbols (8), 44.5% (178) contained undefined medical jargon, exactly 50% (200) contained precautions, 52.5% (210) included medication instructions,

100% (400) contained a medical diagnosis or differential diagnosis, and 35% (140) contained the medical diagnosis in lay terms.

We demonstrated that AVS are most often written at a level that is too high to be helpful to patients. In conclusion, after visit summaries are not written to the appropriate recommended grade levels of <- 8th grade for the average patient population. These results indicate that AVS are unlikely to be of use to the average adult patient. Further studies are needed to show if appropriate grade level summaries will improve quality of care.

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Introduction & Significance

It has long been demonstrated that patients remember very little of what is discussed during a clinical encounter[1]. Up to fifty percent of information provided to the patient during a consultation may be forgotten within 5 minutes of leaving the office. Written advice, in coordination with oral instructions, can improve recall and compliance with medical instructions[2].

To address this disconnect between providers and patients, President Obama signed the Health Information Technology for Economic and Clinical Health (HITECH) Act in 2009. Under HITECH, the Centers for Medicare and Medicaid Services (CMS) can provide financial incentives to eligible healthcare professionals (EPs) and hospitals for demonstrating "meaningful use" of their electronic health record (EHR) systems. Meaningful use is using EHR technology to improve quality, safety, efficiency, and reduce health disparities. One of the criteria for meeting meaningful use for EPs is to provide clinical summaries to patients within three business days of an office visit[3]. A clinical summary has been defined by CMS as "an after-visit summary (AVS) that provides a patient with relevant and actionable information and instructions containing the patient name, provider's office contact information, date and location of visit, an updated medication list, updated vitals, reason(s) for visit, procedures and other instructions based on clinical discussions that took place during the office visit, any updates to a problem list, immunizations or medications administered during visit, summary of topics covered/considered during visit, time and location of next appointment/testing if scheduled, or a recommended appointment time if not scheduled, list of other appointments and tests that the patient needs to schedule with contact information, recommended patient decision aids, laboratory and other diagnostic test orders, test/laboratory results (if received before 24 hours after visit), and symptoms."

However, it is apparent that literacy and numeracy of the population may limit the efficacy of this now mandated tool. Several healthcare organizations have recommended the readability of patient education materials be no higher than sixth to eight grade level (14: Assessing Readability of Px education materials). The National Assessment of Adult Literacy (NALS) in

2003 identified nearly 25% of the population as having limited literacy ability (fifth grade level or lower), with the average reading level of US adults being eighth grade[4]. In Arizona, approximately 13% of the population lacks even basic health literacy skills[5]. Patients who are socioeconomically disadvantaged, belong to a racial or ethnic minority, aged greater than 65, rural or immigrant are at a higher risk of limited literacy skills[6]. Limited literacy has been associated with poorer health outcomes, poorer control of chronic disease[7], higher hospitalization, underutilization of preventive health services, and increased health care costs[8].

Patient education materials written with the goal of improving these outcomes has consistently been shown to be written at too high a reading level. A survey of American Academy of Family Physicians patient education materials was found to be written at a 9.43 grade level[9]. Research on patient education materials in the fields of asthma inhaler use, epilepsy, colon cancer screening, skin care and pressure ulcers, produced similar results[10,11,15]. While not the same as an AVS, the pattern found in patient education materials is suggestive that AVS are also likely written above the level of understanding that the average patient has.

Physicians struggle with identifying and appropriately communicating with patients with limited literacy. Patients commonly do not understand physician instructions which are often laden with medical jargon and too much information[12]. Physicians typically overestimate their patient's literacy skills and often feel uncomfortable or unprepared to adequately explain complex medical information in a format that is useful to the patient[13]. Despite this, CMS now expects physicians to provide written instructions and summaries of the encounter in the form of the AVS.

This research sought to answer questions regarding the actual utility of AVS being produced in one Internal Medicine and one Family Medicine Residency clinic, respectively. Namely, are AVS being produced in accordance with recommended CMS criteria? Are physicians currently writing at recommended reading levels such that the average patient can understand what is being communicated?

Materials & Methods

Study Population & Design: The study evaluated after visit summaries (known as "Patient Plans" in the institution in question) provided to adult patients from one family medicine residency clinic and one internal medicine residency clinic at Banner University Medical Center Phoenix (BUMCP). Patient plans from family physicians and internists at all levels of training (PGY-1 through attending) were included. After receiving the necessary Institutional Review Board approval, patient plans were randomly sampled from adult patients who received primary care services at this facility during the study period from January 1, 2016 to March 31, 2016. Exclusion criteria was defined as patient plans distributed to patients less than 18 years old or to patients whose primary language is not English. We collected data from 200 patient plans from each residency program to be analyzed.

A score card was composed of items determined to be a component of the ideal AVS based on criteria imposed by CMS from the definition of an after-visit summary. This includes patient name, provider office contact information, date and location of visit, updated medication list, updated vitals, reasons for visit, instructions based on clinical discussion, updated problem list, immunizations or medications administered during visit, summary of topics covered during visit, time and location of next scheduled appointment, laboratory and diagnostic test orders, and symptoms.

Importantly, the scorecard also included literacy markers including readability of the physician composed portion of the AVS. Readability was evaluated using the universally accepted Flesch-Kincaid Grade Level Test. This determines the average grade level at which a reader is expected to completely understand the written text. The Flesch Reading Ease Score was also calculated. A score of 0-100 was calculated to demonstrate the ease with which a given AVS text can be read. AVS were evaluated for the presence of acronyms, symbols, undefined medical jargon, and actionable precautions.

Data Collection & Statistical Analysis: Data collection occurred over several months and was done via a secure computer within the institution's network. After visit summaries were randomly selected by the reviewer from the given time period. These summaries were initially read by the reviewer to assure they were not disqualified by the exclusion criteria. Care was taken to obtain approximately equal amounts of AVS from each post graduate year as well as from the attending level. Once identified as an AVS that was proper for the study, the AVS was analyzed by the scorecard and stored in a secure spreadsheet until completion.

Demographic and clinical characteristics were reported as means, standard deviations for continuous variables; and frequencies, percentages for categorical variables. The Wilcoxon Rank Sum was used to compare continuous variables between the family medicine and internal medicine groups. The Chi-squared/ Fisher's Exact Test was used to compare categorical variables. Univariate and multivariate linear regression was used to ascertain the estimated mean difference in the Flesch Kincaid reading level and the Reading Ease Score relative to provider's specialty, respectively, with family medicine serving as the reference group. Furthermore, Univariate and multivariate logistic regression was used to ascertain the likelihood of the reading level falling below the 8^{th} grade level and the Flesch Ease score reaching 65 relative to provider's specialty, respectively, with family medicine serving as the reference group. All p-values were 2-sided and $p<0.05$ was considered statistically significant. All analyses were conducted using STATA version 14 (STATA corp; College Station, TX).

Results

A total of 400 AVS were read; 200 each from the Family Medicine and Internal Medicine residency programs. The demographic results as well as a portion of the scorecard results are found in **Table 1.** The mean age of the patients was 53.5, with 36.5% of patients being male (146) and 63.5% (254) being female. Caucasian patients made up the majority with 47% (188) followed by Hispanic patients at 29.5% (118), African American patients at 20.3% (81), and Asian/Other coming in at 3.25% (13). One quarter of AVS were written by PGY 1s (100), 24.8% by PGY2s (24), 25.3% by PGY3s (101), and 25% by attending physicians in the respective residency programs (100).

Overall, the scorecard results are as follows: 71.8% of AVS contained an updated medication list (287), 54% contained an updated problem list (216), 52.3% (209) contained the time and location of the next schedule or expected appointment, 35.8% had lab or diagnostic tests ordered (143), 51.5% (206) contained acronyms, 2% contained symbols (8), 44.5% (178) contained undefined medical jargon, exactly 50% (200) contained precautions, 52.5% (210) included medication instructions, 100% (400) contained a medical diagnosis or differential diagnosis, and 35% (140) contained the medical diagnosis in lay terms.

Variables	Overall N=400
Patients' Age, Years (mean, SD)	53.5 (17.6)
Patients' Gender (Male, %)	146 (36.5)
Patients' Race (N, %)	
Caucasian	188 (47.0)
African American	81 (20.3)
Hispanic	118 (29.5)
Asian/Other	13 (3.25)
Physician's Year of Training (N, %)	
PGY 1	100 (25.0)
PGY 2	99 (24.8)
PGY 3	101 (25.3)
Attending	100 (25.0)
Updated Medication List (Yes, %)	287 (71.8)
Updated Problem List (Yes, %)	216 (54.0)
Time and Location of Next Scheduled or Expected Appointment (Yes, %)	209 (52.3)
Lab or Diagnostic Tests Ordered (yes, %)	143 (35.8)
Acronyms (Yes, %)	206 (51.5)
Symbols (Yes, %)	8 (2.00)
Undefined Medical Jargon (Yes, %)	178 (44.5)
Precautions (Yes, %)	200 (50.0)
Medication Instructions (Yes, %)	210 (52.5)
Diagnosis or Differential (Yes, %)	400.0 (100.0)
Diagnosis in Lay Terms (Yes, %)	140 (35.0)

Table 1. Family Medicine & Internal Medicine Scorecard Results & Demographics. P-values calculated using the Wilcoxon Rank Sum for continuous variables. Chi-squared/Fisher's Exact used to compare categorical variables.

Table 2 contains the data from the AVS that met the appropriate Flesch-Kincaid Grade Level Test (FKGL) score, denoting plans that were appropriately written, with their specific scorecard results. First, there were 81 AVS that were written at a FKGL of less than 8th grade. Of those, the following scorecard results were obtained: 69.1% (56) had an updated medication list, 54.3% (44) had an updated problem list, 65.4% (53) had the time and location of the next schedule or expected appointment time, 38.3% (31) had lab or diagnostic tests ordered, 51.8% (42) contained acronyms, 3.7% (3) contained symbols, 29.6% (24) contained undefined medical jargon, 59.3% (48) contained precautions, 58% (47) contained medication instructions, 100% (81) contained a medical diagnosis or differential, and 56.8% (46) contained the medical diagnosis in lay terms.

There were 36 AVS that met the recommended FRES score of greater than or equal to 65. Of those, the scorecard results are as follows: 72.2% (26) had an updated medication list, 55.6% (20) had an updated problem list, 66.7% (24) ad the time and location of the next scheduled or expected appointment, 30.6% (11) contained lab or diagnostic tests ordered, 50% (18) contained acronyms, 5.56% (2) contained symbols, 13.9% (5) contained undefined medical jargon, 66.7% (24) contained precautions, 66.7% (24) contained medication instructions, 100% (36) had a medical diagnosis or differential diagnosis, and 69.4% (25) contained the medical diagnosis in lay terms.

Variables	Kinkaid ≤8th grade reading level N=81	Kinkaid ≥65 reading score N=36
Updated Medication List (Yes, %)	56 (69.1)	26 (72.2)
Updated Problem List (Yes, %)	44 (54.3)	20 (55.6)
Time and Location of Next Scheduled or Expected Appointment (Yes, %)	53 (65.4)	24 (66.7)
Lab or Diagnostic Tests Ordered (Yes, %)	31 (38.3)	11 (30.6)
Acronyms (Yes, %)	42 (51.8)	18 (50.0)
Symbols (Yes, %)	3 (3.70)	2 (5.56)
Undefined Medical Jargon (Yes, %)	24 (29.6)	5 (13.9)
Precautions (Yes, %)	48 (59.3)	24 (66.7)
Medication Instructions (Yes, %)	47 (58.0)	24 (66.7)
Diagnosis or Differential (Yes, %)	81 (100.0)	36 (100.0)
Diagnosis in Lay Terms (Yes, %)	46 (56.8)	25 (69.4)

Table 2: Family Medicine & Internal Medicine Readability Scores & Scorecard Results. P-values calculated using the Wilcoxon Rank Sum for continuous variables

Table 3 contains the Flesch-Kincaid Grade Level Test (FKGL) and the Flesch Reading Ease Scores (FRES) for all the after-visit summaries as a group as well as the scores of Family Medicine and Internal Medicine, respectively.

The FKGL of all 400 AVS had a mean of 11.9 (standard deviation 5.17). The FKGL of Family Medicine AVS was 11.1 (SD 5.07) while the FKGL of Internal Medicine AVS was 12.7 (SD 5.15). The coefficient was 0.38 (-0.15, 0.93 with 95% CI) with a P value of 0.16. There were 81 AVS with a FKGL of less than or equal to 8^{th} grade, with 60 of those coming from the Family Medicine residency (30% of total FM AVS) and 21 coming from the Internal Medicine residency (10.5% of total IM AVS). The odds ratio (95% CI) was 0.60 (0.44, 0.81) with a P value of 0.001.

The FRES of all 400 AVS had a mean of 31.8 (standard deviation 25.0). The FRES of Family Medicine AVS was 37.6 (SD 26.5) while the FRES of Internal Medicine AVS was 26.5 (SD 22.1). The coefficient was -2.92 (-5.44, -0.40) with a P value of 0.02. There were 36 total AVS (9%) with a FRES of greater than 65, with 31 of those coming from the Family Medicine residency and 5 coming from the Internal Medicine residency. The odds ratio (95% CI) was 0.42 (0.25), 0.73) with a P value of 0.002.

Scores	Overall N=400	Family Medicine N=200	Internal Medicine N=200		P-value
				Coeff (95% CI)[1]	
Flesch Kinkaid Reading Level (mean, SD)	11.9 (5.17)	11.1 (5.07)	12.7 (5.15)	0.38 (-0.15, 0.93)	0.16
Flesch Reading Ease Score (mean, SD)	31.8 (25.0)	37.6 (26.5)	26.1 (22.1)	-2.92 (-5.44, -0.40)	0.02
				OR (95% CI)[2]	
Flesch Kinkaid Reading Level (≤ 8th grade level, %)	81 (20.3)	60.0 (30.0)	21 (10.5)	0.60 (0.44, 0.81)	0.001
Flesch Reading Ease Score (> 65, %)	36 (9.0)	31 (15.5)	5 (2.50)	0.42 (0.25, 0.73)	0.002

Table 3: Association between Specialty and Reading outcomes.

[1]Coeficients (95% CI) were calculated using Multiple Linear Regression after adjusting for patient's age, updated medication lists, ascertainment of next visit, using symbols, Undefined Medical Jargon, providing medication instructions, and using diagnosis in Lay Terms.

[2]Odds Ratios (95% CI) were calculated using Multiple Logistic Regression after adjusting for patient's age, updated medication lists, ascertainment of next visit, using symbols, Undefined Medical Jargon, providing medication instructions, and using diagnosis in Lay Terms.

Figure 1 is the bar graph that displays the interquartile distribution as well as median values of the FKGL and FRES scores. The median FKGL of AVS from the Family Medicine Residency was 11.1, while the median FKGL from Internal Medicine was 12.7. The median FRES of AVS from the Family Medicine Residency was 31.8, while the median FRES from Internal Medicine was 26.1.

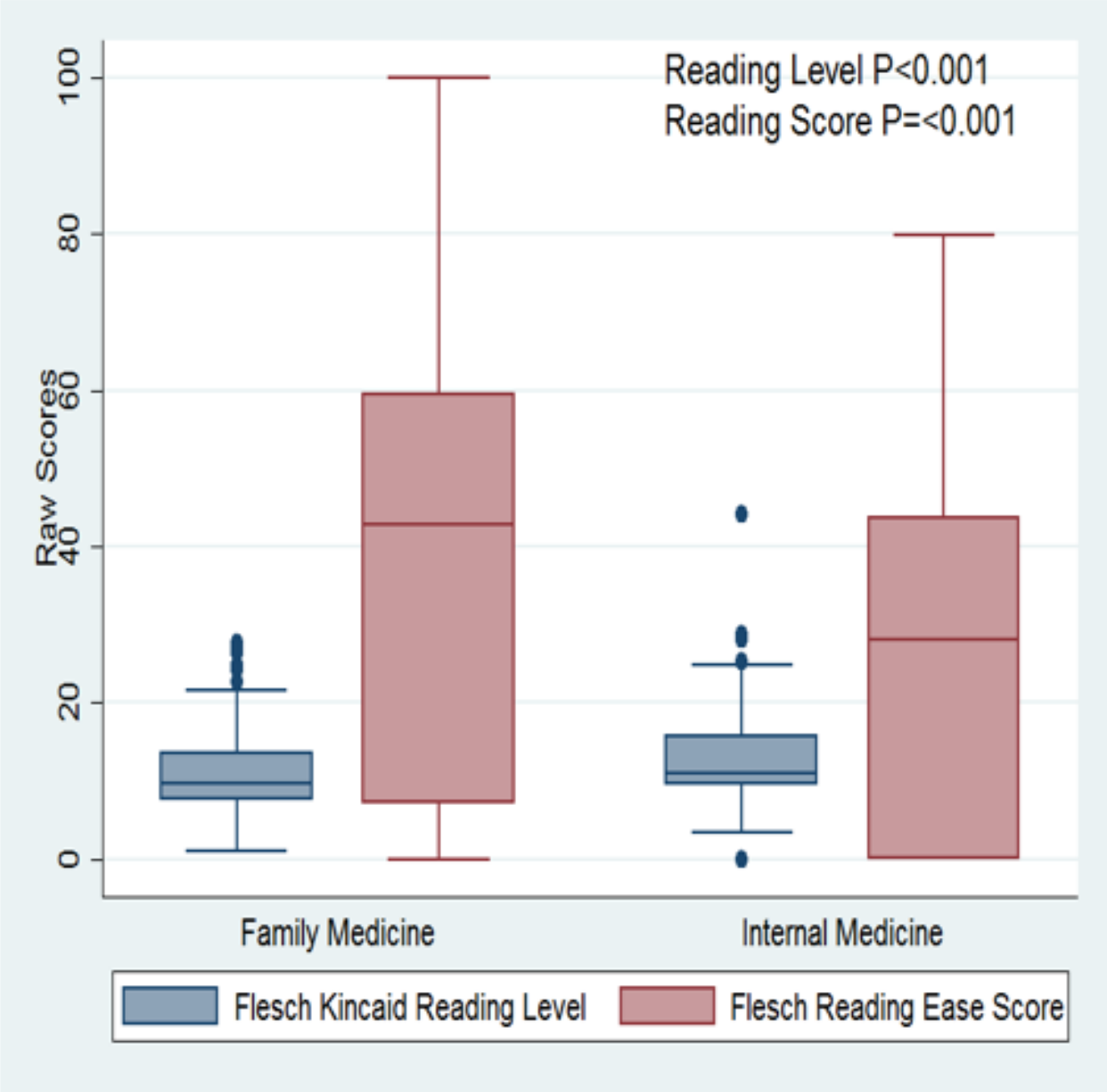

Figure 1: The Median & IQR of Reading Level and Score between specialties. The destitution of Reading level and Score between Specialties. P-values calculated using the Wilcoxon Rank Sum. The red in the graph reflects the FRES score, with T bars showing the total spread of values and the shaded box area showing the 25th-75th percentile scores and a central bar showing the mean value. The blue in the graph shows the FKGL (labeled as Flesch Kincaid Reading Level) score, with T bars showing the spread of values and the shaded box showing the 25th-75th percentile scores with a central bar showing the mean value. The blue points represent outlier scores.

Discussion

In this study comparing the readability of after visit summaries written by the Family Medicine and Internal Medicine residencies, both programs were found to have written AVS at a higher than recommended reading level that is incompatible with patient comprehension.

Health literacy, which is the capacity to obtain, interpret, and understand information needed to make health-related decisions, is considered the single best predictor of an individual's health status. It has been shown that the disparity between the average patient literacy and patient health information is a barrier to patient involvement in their own care[14,16]. Poor health literacy is estimated to contribute more than 73 billion dollars of additional burden to the US healthcare system[17]. Adult literacy surveys show that nearly half of the US population is either "functionally illiterate," with a reading grade level of 0 to 5, or "marginally literate," with a grade level of 6 to 8[5]. Therefore, many Americans struggle to understand available health information including their own personal information contained in AVS.

The Flesch–Kincaid readability tests are designed to indicate how difficult a passage in English is to understand. There are two tests, the Flesch Reading Ease Score (FRES), and the Flesch–Kincaid Grade Level (FKGL). Although they use the same core measures (word length and sentence length), they have different weighting factors. The results of the two tests correlate approximately inversely: a text with a comparatively high score on the Reading Ease test should have a lower score on the Grade-Level test.

The scoring system of FKGL is straightforward- the score indicates the school grade level required to understand the writing. The overall score of 11.9 on FKGL indicates that the average AVS in this study required the reading skill of a high school senior. This did not have statistical significance (P value 0.16). The scoring system of the FRES is such that greater than 65 correlates to an 8th grade reading level, and higher scores indicate easier levels. The overall mean of 31.8 on FRES demonstrates that the average AVS difficulty level would fit the "difficult" to "very difficult" reading classification. This had statistical significance with a P value of 0.02. Family Medicine AVS were slightly easier to read as demonstrated by better objective scores in

both the FKGL and the FRES than the Internal Medicine program. Both the FGKL and FRES data results support the alternative hypothesis that physicians write at too high of a level for patients to routinely grasp.

To our knowledge this is one of the first studies to compare the readability of AVS to the functional reading skills of the average adult patient. Previous similar research has focused on the readability of discharge summaries or patient education provided in brochures or online websites.

It is perhaps unsurprising that the average AVS is written at too high of a level for the average patient to understand. Physicians spend nearly a decade of rigorous training to understand complex topics in physiology, anatomy, pathology, pharmacology, etc. They are trained to be precise and specific in their knowledge and communication in the language of medicine. This is a language that is all to often foreign to the patient. A patient is more likely to understand the term “high blood pressure” than “hypertension”, for example. Physicians in training have only recently mastered the language of medicine and thus are likely to use it regularly, even in the presence of patients, in order to cement their competence and knowledge. Likewise, experienced physicians are likely to do the same thing but the reason being they have become so accustomed to being fluent in the language of medicine they may forget what it is like to sit in the patient’s shoes.

Nevertheless, motivation for physicians to help their patients understand their own medical conditions is imperative; it is required by both the Hippocratic oath and current government regulations. It is concerning that so many AVS were missing CMS recommended content. This is a clear indication that one of two things is occurring: the CMS recommendations are not being followed because they are overly burdensome and not useful or because physicians are not currently communicating all important information that CMS suggests. Furthermore, complying with the CMS mandate to qualify for meaningful use of an EHR (via appropriate usage of after visit summaries) are significant: there is financial incentive for the EP provided by CMS as well as a desire to see improved outcomes, lower costs, and higher quality of care.

However, some physicians remain frustrated by the requirement to produce an AVS[18]. It is possible that physicians are merely fulfilling the requirement with lip service- creating an AVS in merely for the sake of compliance. Also, a possibility is that well-meaning physicians are producing AVS, but that they are written at a level that is above the understanding of most of their patients, proved true by this research.

There are several potential limitations of this study. First, we are completely reliant on the FKGL and FRES formulas to determine readability. There are many other readability formulas in use today that employ different mathematical calculations to judge the readability of text, although FKGL remains the most commonly used. Additionally, we did not perform a direct measurement of the true literacy rates of our patient population and instead opted to use national averages. The study could also have been enhanced with a mechanism to include English Second Language (ESL) patients, who make up a significant portion of the patient population at our institution as well as the country at large. Finally, interrater reliability could be improved by having multiple reviewers read each individual AVS to provide independent scoring. This study has largely completed by a single individual as the interpreter.

Future Directions

It remains to be seen how much patient care can improve if residents and attendings improve their writing. A study such as ours is beneficial for both institutions and physicians to demonstrate that see required AVS may not actually be producing the desired benefits. As a result, we recommend that physicians strive to explain terminology in their respective fields to aid in patient comprehension. Every effort should be made to ensure that patient-oriented language is used so that AVS are at an appropriate readability level. This could include a brief intervention such as a training or lecture to educate physicians on how to communicate with their patients at an understandable level. Emphasis ought to be placed on the use of shorter sentences with simpler vocabulary will improve readability. Additionally, methods such as the "teach back" technique can help physicians be sure their patients have understood the information that was discussed. Sharing information with family could also improve patient understanding.

Conclusion

The after-visit summaries written by physicians of all levels of training of are too often written at too high of a reading level. Information should be written to the appropriate recommended grade levels of 6-8th grade for the average patient population. Further studies are needed to show if appropriate grade level summaries will improve medical compliance and quality of care and lower healthcare costs.

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